Don't Shoot Me, I'm Only The Transport Planner (apologies to Sir Elton John)

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1. Introduction

A big determinant of the shape of cities is the role and direction of transport planning. The different approaches and outcomes of this discipline can be clearly seen in a simple comparison of the continental European cities with the American and Australian cities. While these European cities retain a balance between private and public transport and non-motorised modes and city centres are mostly intact with extensive pedestrianisation schemes, American and Australian cities are dominated by automobile transport and their centres are frequently hostile places, being in some cases almost two-thirds roads and parking space.

The reasons for these differences are obviously complex, including historical and cultural factors, but transport planning practices have played an important role too. In this paper an historical insight is provided into how transport planning methods and practices, based on what has been derogatorily termed a "predict and provide" computer modelling approach (which treats traffic as a liquid), have helped to evolve the automobile-dependent city. This is followed by an explanation of the way technical and computer model-based approaches to transport historically have fallen far short in providing the policy direction and vision required in developing well-functioning transport systems in cities.

In many cases these traditional modelling shortcomings endure until today. For example, the recent UK pronouncements about the expectation of significant new traffic growth over the coming decades (Local Transport Today 592, March 16-29), the Aberdeen Western Peripheral Route (http://www.awpr.co.uk/(accessed April 5, 2012,) and the Lancaster Northern Bypass, to name just a few current issues in the UK alone, have all the hallmarks of this now widely discredited predict and provide approach. More extensively, the emerging economies have tended to uncritically import these post-World War 2 traffic modelling approaches. Partly as a consequence of the conceptual framing of transport problems inherent in these models, focussing almost entirely on the impossible dream of congestion removal, many are building freeways at an alarming rate (e.g. in India and China).

Counter to this rather negative story, there is now clear evidence that other approaches are possible, which yield very different results for cities (Goodwin, 1997). A fundamental underpinning of the way that land use-transport models operate is to treat traffic analogously to a liquid, something that retains its original volume regardless of the container into which it is placed, in this case the capacity of the road infrastructure which accommodates it. This conceptual treatment makes traffic tantamount to immutable. However, extensive evidence is now available that traffic is by no means a fixed given, but rather behaves more like a gas, expanding to fill the space available and compressing to cope with reduced road capacity (e.g. http://articles.latimes.com/1997-05-14/local/me-58478_1_freeways-capacity-traffic (accessed April 5, 2012); Siegel, 2007).

There is also evidence now about "peak car use" which undermines the whole historical trajectory of never ending traffic increases and road building cycles that traditional transport planning has facilitated (Newman and Kenworthy, 2011; Millard-Ball and Schipper, 2010; Puentes and Tomer, 2009). This paper will attempt to summarise the evidence on these matters, thus pointing the way to a more productive approach to transport planning than blind acceptance of the output of traffic models using too simplistic assumptions as the basis of their projections and prescriptions. This new approach might be termed "Debate and Decide", which inherently treats traffic as a gas whose volume is thus compressible given reductions in road capacity.

Transport models are useful inventions if used in a strategic and controlled way. So, rather than 'throwing the baby out with the bath water', some suggestions are also made in this paper about how the technical procedures might be better used to provide solutions to growing motorisation in cities and result in more sustainable transport in cities.

2. The origins and philosophy of computer-based transport planning

Perhaps the most important and influential of the technical procedures in transport planning is the land use-transport modelling process, which emerged in the mid 1950's as a distinct area of study. The watershed for land use-transport modelling was the publication in 1954 of Mitchell and Rapkins' "Urban traffic - A function of land use" which first drew systematic attention to the fact that traffic arises out of land use (Brown et al, 1972). The implication of this book was therefore that the future of transport in any city is inextricably linked to whether the city is evolving with compact, mixed land uses which support public transport, walking and cycling or sprawling in car-dependent patterns that ensure the car is needed typically for more than 80% of daily trips.

The immediate post-war period, as will be discussed in more detail below, was a time of huge economic optimism and growth when the car was seen as the future of urban transport. The conceptual breakthrough provided by Mitchell and Rapkin, accompanied by the rapid evolution of computing power, led to a meteor shower of multi-million dollar transport studies in North America, Australia, Europe and many other countries. The purpose of these studies was to plan for anticipated growth in population, jobs and traffic flows as far ahead as 20 to 30 years such that there would continually be an equilibrium between the supply of transport facilities and demand for travel as it arises out of land use. As will be shown, this is very similar to the calls in 2012 from the DfT in the UK, which see vehicle miles of travel in England growing by up to 55% over the next 25 years (see later).

The concept of the "grand transportation study" was embraced with enormous enthusiasm with virtually every developed city at some point between about 1955 and 1975 undertaking at least one major transportation study. In the US since 1962, urban areas over 50,000 people have been required to do land use-transport studies on a regular basis to qualify for Federal road funds. These studies were widely acknowledged as being unashamedly highway-oriented (Brown et al, 1972). Governments vigorously promoted them partly because they were a high profile vote-winning exercise which appeared to be tackling transport issues and partly because of the political influence brought to bare on Governments by the road lobby and a handful of international transport consulting firms with close links inside transport bureaucracies the world over, who very quickly adopted, and to some extent monopolised, the then esoteric technical procedures. There was a huge amount of money to be made from "grand transportation plans" during the 1950's through to the 1970's, and transport consulting firms were only too eager to adapt their technical expertise to fit the political expectations of the time (witness studies with names like SATS – Sydney Area Transport Study; CATS – Chicago Area Transport Study; MATS – Melbourne Area Transport Study, ad nauseum).

Part of the prevailing philosophy during this period was that transport planning was largely seen as a value free, objective science carried out by equally objective traffic experts, mostly males. Traffic was viewed as an independent and unavoidable, indeed immutable, physical phenomenon and there were few questions raised about the validity or even the desirability of attempting to cater for all projected growth. Technical manuals and standards for road design to cope with growing traffic were developed apace and the work of transport planning was left mostly in the hands of single discipline technical analysts.

The fact was, however, that these highly technical and expensive studies were not scientific nor value free, but were strongly influenced by their social setting. The 1950's and early 1960's were a very optimistic, certain and prosperous period characterised by growth and consumption orientated lifestyles. Car ownership was booming and the political expectation, at least in the US and Australia, and for a time in Europe, was that the automobile would be the future of urban transport. Planning was based on a standard of one or two cars per family. Priority was therefore given to automobiles and road construction, while the pillars of transport planning became mobility and speed. Accessibility largely took a back seat to mobility, meaning in simple terms that a 200 metre walk at 5 km/h to a corner shop for a litre of milk became a 5 km drive at 50 km/h to a 'big box' shopping centre. The approach was to "construct away" any problems of the car, especially the traffic queues and increasing number of traffic accidents and deaths through better road systems (Gunnarsson and Leleur, 1989).

Thus right from the outset land use-transport studies tended to be strongly associated with planning for roads and cars rather than a balance of transport modes, and most of the US and Australian land use-transport studies pioneered the building of elaborate highway and freeway systems (Brown et al, 1972).

The first major transportation plans to appear were the Chicago and Detroit Area Transportation Studies, which were very much along the lines just described. These two studies pioneered the technical procedures we know today as the land use-transport modelling process (Black, 1981). These technical procedures have been refined and tuned over the years but have evolved into what is generally known as the "conventional" land use-transportation planning study. It has in fact been said that there is "a generalised international urban transportation planning process" or UTP (Ben Bouanah and Stein, 1978).

This process can be characterised by the following major tasks (see Black, 1981):
(1) Formation of goals and objectives;
(2) Inventories of the present situation (mainly Household Travel Surveys (HTS) to determine a population's trip making frequency, purposes, modes and other characteristics), which are then used to undertake the four key mathematical steps - trip generation, trip distribution, modal split and traffic assignment (hence the other commonly used term: 4-Step Gravity Models);
(3) Forecasting of new land use plans and their resulting traffic, modelled on the baseline set of data developed under the previous step;
(4) Analysis of alternative transport networks to cope with predicted travel and;
(5) Evaluation of various alternatives according to costs, benefits, impacts and practicality, followed by recommendations.

These tasks, however, are by no means value-free, objective technical procedures and there are numerous ways that they can be biased to facilitate certain directions. The transportation studies of this early era pioneered large-scale road and highway planning and in the process public transport, especially rail, was glossed over and effectively eliminated from consideration in many cities, (e.g. Denver, Detroit, Phoenix, Houston and most other US cities). Stopher and Meyburg (1975) show this clearly when they comment about how public transport was dealt with technically in the modal split stage of the US studies:

"The earlier in the process that transit trips could be estimated and removed from further consideration, the more efficient would be the resulting highway travel forecasting procedure."

The analysis would then proceed with most forecasting based on private transport growth and land use patterns to match. Once such low density land use is in place public transport is more often than not based on an inefficient and infrequent bus service (often merely demand responsive buses in very low density areas), walking is reduced to taking the dog around the block, and bikes are hardly used at all, even by children. Car usage proliferates and a massive increase in road funding is then needed to provide the highway capacity for the "grand plan" needs and to keep the system from perceived collapse.

There are other ways that the large-scale transportation studies using 4-Step traffic models have played an important role in facilitating automobile dependence in cities (Newman and Kenworthy, 1984). For example, the modelling process does not address walking and bicycling in any meaningful way due to the fact that the models are set up with a set of Origin-Destination Zones (O-D zones) and are designed to measure trips from one zone to another. Shorter intra-zonal trips, which are possible by foot and bicycle, are hardly dealt with, but are placed in a kind of 'throw away' category called "centroid connectors" and not modelled effectively. In addition, the smaller scale effects of local density increases or mixed land use within an O-D zone are not brought out in the model results. The density of population and jobs within each zone is an average and therefore considered to be uniformly distributed. The distribution of that density within a zone is therefore not modelled properly or reflected in policy conclusions (e.g. high density, mixed use TODs around rail stations, which can greatly alter overall travel patterns).

The shortcomings of these traditional 4-step models are dealt with in a comprehensive way by Atkins (1986) through a detailed review of over fifty critical studies. Atkins shows clearly how in every respect, at least up until that time, there were major deficiencies and flaws in conventional transport modelling studies. These problems cover the models' performance and accuracy, structural deficiencies or specification errors in the models and a mismatch between the capabilities of the models and the purposes for which they are used. Most importantly, this last aspect shows how they are not good predictive tools, and are of little use in examining genuine policy options designed to effect change in cities. The specification errors are inherent in the data collection process, the development of the zones and networks, the trip generation predictions, the trip distribution, modal split and traffic assignment stages, calibration and validation and finally in forecasting ability.

Such problems can still be found today in terms of the way problems are framed and the solutions offered. This is because most models are still premised more on a supply-side approach of greater road infrastructure to solve circulation problems and other perceived transport inadequacies in cities, rather than on an approach which, for example, asks 'how do we change the existing dependence on cars by providing more sustainable and cost-effective alternatives?'

One of the papers reviewed by Atkins sums up the experience with traditional transport modelling in the following rather damning way:

"It might be said (with due apologies) of computer-based transportation modelling that 'never before in the history of human conflict has more money been spent by more people with less to show for it'" (Drake, 1973; 1)

3. Self-fulfilling prophecies

Building large road systems changes the nature of the city into a more automobile-dependent one. In general, modelling has assumed that land use is "handed down" by land use planners and that transport planners are merely shaping the appropriate transport system to meet the needs of the land use forecast. This is not the case. One of the major reasons why freeways around the world have failed to cope with demand is that transport infrastructure has a profound feedback effect on land use, encouraging and promoting new development wherever the best facilities are provided (or are planned). Most of the major US cities such as Chicago, New York and Detroit, which built extensive freeway systems as proposed by their grand transportation studies, found that the freeways spread land use and generated more and more traffic until very soon after completion the freeways were already badly congested. Sometimes this happened at opening because urban sprawl had intensified to such an extent during the planning and construction phase that the road facilities were already out-of-date. Many studies now refer to these issues under the rubric of "induced demand" (Goodwin, 1997; Zeibots, 2007; Siegel, 2007) and the USEPA now requires that environmental assessments of the transport emissions impacts of new highways and freeways formally take into account that more vehicle miles of travel (VMT) are generated by these projects than the traffic models typically predict (Newman and Kenworthy, 1999).

Once locked into a primarily road-based system a momentum develops which is very hard to stop. The response to the failure of freeways to cope with traffic congestion is to suggest that still further roads are urgently needed. The new roads are then justified again on technical grounds in terms of time, fuel and other perceived savings to the community from eliminating the congestion. This sets in motion a vicious circle or self-fulfilling prophecy of congestion, road building, sprawl, congestion and more road building. This is not only favourable to the vested interests of the road lobby and some land developers, but it also builds large and powerful government road bureaucracies whose professional actors see their future as contingent upon being able to justify large sums of money for road building. This commitment often translates into direct political activity where policy makers and politicians are influenced by what is narrow or biased technical advice. In this way road authorities can become de facto planning agencies directly shaping land use in a city and having a large vested interest in road-based solutions to the transport problem.

4. The European experience

In the post-war period European cities began to increase in automobile ownership and use. The pace of change and impact on the old cities became particularly evident during the 1960's as the transport planning and traffic engineering professions in conjunction with decision-makers set about attempting to cater for this growth in automobiles by expanding existing road capacities, building new radial roads into the city centre and increasing parking facilities to cope with the influx of vehicles. Transport planning solutions were clearly being strongly influenced by the mathematically modelled results of the time. The typical 20-year graphs showed increasing income and wealth, growing car ownership and use, declining public transport, walking and bicycling, projections of large road and parking capacity increases to prevent the cities drowning in traffic and a substantial mobilisation of public funds into road infrastructure.

Transport planners used their land use-transport planning models and overtly objective forecasting techniques to show an inevitable trend of accelerating motorisation and how to cope with it. But what happened? To some extent they were right, their analyses were partly vindicated and the patterns of change towards more automobile orientated growth are particularly evident in data from 1960 to 1980 (see Kenworthy, 1990; Newman and Kenworthy, 1989). However, the full implications of their prescriptions for cities, particularly in continental Europe, were soon found to be unacceptable. The rich fabric and architectural history of the cities started to be threatened by destructive road plans. By the end of the 1960's many city centres were drowning in traffic, inner city residential qualities were being eroded, air pollution and noise were becoming insufferable in the tightly packed urban layouts and a political momentum was developing to do something about "the traffic".

What happened, particularly in West Germany around the late 1960's, was a determination not to allow further deterioration in the quality of cities and to peg back the motorisation trend through a commitment to public transport and pedestrianisation. This was the period when German cities began to plan and build their U-Bahn and S-Bahn systems and create networks of pedestrian streets with festive market places and human scale city spaces. In Munich the process was accelerated by the 1972 Olympic Games. It involved a large injection of Federal money into rapid transit and a curtailment of road expenditures (Hall and Hass-Klau, 1985). Had they been fully implemented, the formulations of conventional transport planning, being based more on following established trends than creating new ones, would probably have seen European cities follow a similar, but not so extreme pattern, as that of the US and Australian cities due to land constraints.

However, quite widespread popular rejection of this option in favour of protection and regeneration of the cities into people-orientated places, and strong political and financial support for public transport saw the continental European cities at least partially break the self-fulfilling prophecy of more and more road building and intense automobile dependence. Cities in Britain followed the road-based solutions to a greater extent, as evidenced for example by the removal of the tram systems in all UK cities except Blackpool and the relative scarcity of new urban rail systems since then (Barry, 1991). It is only comparatively recently that new systems have been planned and implemented (e.g. light rail systems in Manchester, Sheffield, Birmingham, Bristol and Edinburgh - see Simpson, 1989).

The solution to the problem continental European cities were facing did not come out of relying on the guidance of technical transport planning methodologies. It came out of a political process involving a sense of vision which had to be fought as hard as anywhere in the world, and it had to go largely against the mechanistically determined view of the future as prescribed by conventional transport planning. Monheim (1988) relates, for example, the difficulties faced by those wishing to close off streets in the centre of Nürnberg to create a pedestrian network. The transport planners claimed that it could not be done because of the traffic volumes using the streets. However, it was done and their worst fears did not eventuate because between 71% and 80% of the traffic simply dissolved in each of the four stages as the pedestrianisation progressed between 1972 and 1988 (Museumbrucke and Fleischbrucke – 1972/3; Karolinenstrasse and Kaiserstrasse 1972/3; Bankgasse and Alderstrasse - 1982; Rathausplatz – 1988: personal communication Rolf Monheim). Nürnberg now has one of the world's most beautiful central cities and an underground railway to service it.

This process which many European centres went through of deciding between a mechanistically determined future for their cities and one which involved a strong degree of self-determination is neatly summarised by Herman Daly. In referring to the self-fulfilling nature of many energy consumption predictions, he also effectively sums up the basic choices involved in setting a city's transport agenda:

"We can make a collective social decision regarding energy use and attempt to plan or shape the future under the guidance of moral will; or we can treat it as a problem in predicting other peoples' aggregate behaviour and seek to outguess a mechanistically determined future. As the art of foretelling the future has shifted from the prophet to the statistician, the visionary, goal oriented element and the accompanying moral exhortation have atrophied, while the analytical, number crunching has hypertrophied. (Daly, 1978)

Evidence of the battle fought in Europe between these two different approaches to transport planning is partly seen in comments by the Mayor of München and the Mayor of Vienna.

> "With every million we spend on roads we will be closer to murdering our city." Mayor of München (1975)

> "…unlimited individual mobility … is an illusion … the future belongs to the means of public transportation" (and this will be) a driving force of city renewal". Mayor of Vienna (Gratz, 1981)

5. The failure of model-based transport planning

High level failures

In the broad sweep of cities around the world, conventional transport planning practices and wisdom cannot claim to have left behind a proud legacy. Nowhere is this more evident than in the traffic chaos characteristic of many US cities such as Atlanta, Houston and Los Angeles. A similar situation is evident in Australia though it hasn't reached the proportions found in the US. After decades of following the advice of practitioners using transport-land use models as one of their basic modus operandi, cities have been left with few apparent solutions to their traffic problems and in many cases few options other than to endure the traffic chaos on the roads or provide token gestures such as HOV lanes. This problem which escalated in the US in the 1980s was seen partly in the multiplication of articles and books at the time about congestion, with titles like: Metropolitan Congestion: Towards a Tolerable Accommodation (Larson, 1988); Resolving Gridlock in Southern California (Poole, 1988); "Managing" Suburban Traffic Congestion: A Strategy for Suburban Mobility (Orski, 1987). Other articles and books on the subject abounded during this period (e.g., Cervero, 1986; Pratsch, 1986; Cervero, 1984; Gleick, 1988).

The overwhelming impression is of cities that can only hope to throw palliatives at a problem that has much deeper causes. Policies that are frequently suggested such as extended or early work hours, carpools and van pools, computerised traffic lights or discounts on transit are hardly going to alleviate or significantly arrest the problem. Technological wizardry was also sought through the Intelligent Highway System launched in the US in 1995, representing a conglomeration of traditional highway lobby interests and the IT industry to create a system that would essentially micro-manage traffic flows on the road system during peak hours in order to provide a better relationship between supply and demand (http://www.sti.nasa.gov/tto/spinoff1996/36.html). This programme involves research into what causes congestion on a micro-level so that drivers can relate to the street system in a totally interactive way, being told which routes to take to avoid snares, when to enter freeways from ramps to get the best run and at what speed to travel (Gleick, 1988). One of the key ideas is that somehow, if congestion is understood in a more detailed way, roads and people can be manipulated through electronic surveillance to keep traffic flowing. It is also sometimes suggested that California, for example, should double-deck all its freeways, but perhaps as 'tollways', to encourage those who can afford it to pay the correct economic price for the privilege of moving around the freeway system at peak hour (Gleick, 1988; Poole, 1988).

The disturbing part about all these approaches is that they are seeking to treat only the symptoms of an ailing transport system, albeit in ever more technically sophisticated ways. This overlooks the root causes of the problems, which lie largely in inefficient land use patterns and transport policies that prioritise road capacity increases over serious transport demand management (TDM), including proper road pricing (Whitelegg, 2011) and provision of higher quality public transport, cycling and walking infrastructure. The process of developing these technological solutions can create an unreal expectation that technology alone will solve the problems of the city.

A small digression into the issue of new technologies and fuels for propulsion systems demonstrates this point further. Many still believe that alternative fuels and new types of cars will be the panacea to the problem of "peak oil", which will see the world's supply of conventional oil become increasingly problematic and expensive (Campbell and Laherrere, 1995). To realise how persistent such thinking can be, one only has to consider the current hype over electro-mobility in Europe which seems intent on replacing 1 km of petrol/diesel driving with 1 km of electrically powered driving, as though there are not already very good social, economic and environmental reasons for fundamentally reducing car use (Kenworthy, 2011).

Obviously, technological innovation is a crucial element in progress and problem solving and will always be sought, but there is a constant need to weigh such innovation against other issues and a more holistic vision of a future society. In the case of transport energy, the reality is that large-scale fuel production from biomass, coal and oil shale has overwhelming economic and environmental, as well as climatic and human adaptation problems, which makes widespread use of these alternative fossil fuels for transport very unlikely.[1] New automobiles such as electric cars, although dramatically improved technologically from years ago and increasingly piloted in cities today, are still decades away from widespread market penetration, due mainly to the intense capital investment requirements in changing an entire automobile industry, fuel production and distribution system and technical support network over to electricity. The frenzied search for alternative fuels in the 70's and early 80's after the first two oil crises in 1973 and 1979 and the on-going manifestation of this technological 'silver bullet' approach in electro-mobility today, delay the search for deeper transport and planning solutions, which will produce a better overall quality of life in cities.

The above analogy in the field of transport energy should not be lost for its relevance to the central argument of this paper. Transport planning as a whole seems slow to respond to the new imperatives in cities and the failures of the past. There is a tendency to hang onto entrenched beliefs, which have been shown to be false. For example, roads are still partly justified on the basis of simple cost-benefit analyses involving savings in fuel, time and sometimes emissions, time being the key item, which usually constitutes 70% to 80% of all monetized economic benefits. This occurs notwithstanding the widely documented Marchetti Constant of a 65 to 70 minute overall travel time budget in cities through the millennia regardless of the dominant transport mode and showing that time savings due to speed increases in fact do not occur, but are rather just used to travel further (Marchetti, 1994; Newman and Kenworthy, 2006).

It is very clear that from an urban systems perspective the analyses are wrong and that fuel, time and emissions are really costs of new urban road projects in cities particularly in those already highly dependent on cars (Newman and Kenworthy, 1984 and 1988; Newman, Kenworthy and Lyons, 1989). The fact that major new roads are sometimes still touted as solutions to congestion seems to suggest something of an inability to learn from past events. Almost fifty years of experience has demonstrated the futility of building more extensive road systems to relieve congestion and the environmental implications for the city of that approach are dramatic and widespread. For example, the push for radical solutions to transport problems in Los Angeles in the 1980s came from government environmental organisations faced with some of the world's worst air pollution which was estimated to cost the community at that time some $US9.4 billion per year (The West Australian September 20, 1989 p80/1).

And yet the 'roading' approach still persists. Bremen, a city in northern Germany renowned for its progress in car sharing and non-motorised mode use, still struggles with the issue of a major bypass (see WTPP 18.1/18.2 editorial), as does Aberdeen in Scotland with its extremely expensive Aberdeen Western Peripheral Route. Lancaster's Northern Bypass, which cost £130 million for 4.5kms or £29 million per kilometer, is another recent example of excursions into this less than fruitful, indeed destructive transport strategy approach. Recent UK government pronouncements also herald a continuation of a "predict and provide" approach, with a staggering estimate of between 34% to 55% more vehicle miles of travel in England between 2010 and 2035 and rejection of the "peak car use" hypothesis (Local Transport Today 592: http://www.transportxtra.com/magazines/local_transport_today/news/?iid=467, accessed April 11, 2012).

As if all of the foregoing evidence were not sufficient evidence of the inability of freeways to really provide solutions to traffic problems, we have further evidence of a reverse process of pulling freeways down being highly successful in actually reducing traffic. This evidence supports one of the key high-level as well as the technical failures of transport planning and modeling: the failure to recognise traffic as behaving fundamentally like a gas and not a liquid.

Bringing together various sources, there are innumerable historical and more recent examples of 'trip-degeneration', as it was termed by the late John Roberts (TEST, 1992):

• By 1998 there were already at least sixty documented cases worldwide where roads were closed or traffic capacity was reduced and 20% to 60% of traffic disappeared.
• Tower Bridge, London closed in 1994 due to structural problems: after 3 years traffic was still not back to original levels.
• Part of London's ring road, the Ring of Steel was closed in 1993: Traffic fell by 40%.
• London's Hammersmith Bridge (30,000 vehicles per day) was closed to all traffic except buses and cyclists due to structural problems. A survey of commuters a few days before closure and the same people after showed 21% no longer drove to work. They switched to transit, walking and cycling and congestion in surrounding areas did not markedly increase.
• West Side Highway, New York City: 1973 one section collapsed and most of the route was closed. A 1976 study of the remaining portion based on traffic counts three years prior to closure and two years after showed 53% of trips disappeared and of those trips, 93% did not reappear elsewhere.

• In 1989 an Earthquake destroyed the Embarcadero Freeway in San Francisco and it was not rebuilt and the predicted chaos never materialised. The whole waterfront area of San Francisco was revitalised.
• In 1996 San Francisco's Central Freeway upper deck was torn down due to instability following earthquake damage and traffic chaos did not materialise.
• Melbourne, Swanston Street Transit Mall: Street carrying 30,000 vehicles per day closed to regular traffic. Traffic chaos in surrounding streets was vehemently projected during the lead up period. After closure there was no chaos. Some increases in volumes were found on surrounding streets, but it was well within the capacity of the street to handle it.
• Portland: Harbor Drive Freeway along the Willamette River waterfront was closed in 1974 and then removed and a linear was park created (Tom McCall Waterfront Park). Traffic chaos did mot materialise, but the whole downtown was revitalised with LRT, people places and markets and sound urban design for pedestrians and transit users.
• Seoul, South Korea: The Cheonggye elevated expressway of 6 km in length running through central Seoul was torn down between 2003 and 2005, along with Cheonggye Road beneath it, together carrying 168,000 vehicles per day, and no traffic chaos ensued. In fact the traffic engineer interviewed in the documentary film made about the project reveals that the overall average traffic speed in the City of Seoul actually rose by 1.2 km/h, contrary to the more normal expectation of gridlock. This project has led to a more general "road diet" approach in Seoul, emphasising new bus lanes, improved subway operations and more walkable environments. The city is being greened (Schiller et al, 2010).

(Sources: Surface Transportation Policy Project, March 1998 issue of Progress; Seattle Urban Mobility Plan: Case Studies in Urban Freeway Removal (found at: http://www.cityofseattle.net/transportation/docs/ump/06%20SEATTLE%20Case%20studies%20in%20urban%20freeway%20removal.pdf, accessed April 10, 2012; Siegel, 2007; http://www.pbs.org/e2/episodes/310_seoul_the_stream_of_consciousness_trailer.html. accessed April 10).

These projects are on top of the almost fifty years of successful pedestrianisation schemes in European cities such as Munich, Copenhagen, Köln and so on, which have also showed that significant amounts of traffic simply disappear following road closures and the cities become more livable and sustainable (e.g. see earlier example from Nürnberg).

The extent to which transport planning has lost its way since the Second World War and still so often fails to provide decision-makers with the answers to urban transport problems, is partly seen in the following statement from the late 1980s reviewing Transportation Planning in a Changing World (Nijkamp and Reichman, 1987). Excerpts from the review read as follows:

> "This book clearly illustrates the confused and contradictory world of transportation planning. It is a collection of papers from a series of three international workshops on transportation sponsored by the European Science Foundation, and has no solid context or clear message that could be utilised to improve the world of transportation planning…the book fails to get to grips with the enormous failures of technical and model-based transportation planning ideology and is very thin on societal and cultural impacts… There is no clear discussion of the … multiple implications of increasingly higher levels of motorisation. Walking and cycling and road safety and urban design do not figure in this volume, and these are major issues of importance to transportation policy in the age of car dominance…The book is part of the problem it would claim to be examining…contributing to the mass of 'received wisdom' which delays innovation, social awareness and genuinely critical transportation policy analysis." (Whitelegg, 1988)

There is a sense that a significant part of the malaise into which transport planning has fallen is a preoccupation with the narrow cost-benefit analyses for new roads, which form the 'punch line' of the detailed technical and mathematical modelling approaches. Such approaches go deeper into the microscopic aspects of, for example, travel behaviour or modal choice, without much of an appreciation for their broader context or how the work can be effectively applied to produce tangibly better cities for people. There is a danger that a lot of transport planning modelling and predictions of the future are done without much of a feeling for what might be called the "soul" of the city and what will need to be done in practical terms if it is to become a better place to live. It seems that there is little point in becoming increasingly involved with "tools" and "means" if there is no clear direction or leadership from within the discipline as a whole about how the transport planner should really be trying to contribute to the betterment of the city.

Edmund Bacon, the famous American urban planner and architect from Philadelphia and outspoken critic of automobile-based planning, provides a useful comment on the consequences of overzealous and narrow economic number crunching in the formulation of urban transport policies:

> "The sad thing is how often the planners in the United States seize mindlessly upon the latest fashionable planning gimmick. The cost-benefit ratio was one of the first of these, a" scientific" method for determining where a highway should be placed by adding up the costs of alternative highway routes and comparing these with a quantification of the value in dollars of the time saved by the highway user. This was adopted universally as the only right way to do things until its continued use imposed such outrageous consequences that it dawned on someone that saving the highway users a few seconds of time would be less socially and economically desirable than destroying irreplaceable landscapes, historical sections of cities, coherent neighbourhoods, or networks of human relationships. Underlying it all was the failure to realize that the development of policy through the manipulation of numbers is always bound to be wrong because numbers by definition leave out the unquantifiable variables: Human passions, beloved traditions, human will, and it is these which are really important. While cost-benefit analysis and its many successors have been discredited, basic understanding of the destructive effects of relying primarily on numbers in the formation of public policy still has not penetrated the consciousness of the planning profession in the United States, and that profession is gradually committing suicide in consequence, persisting in the delusion that it is a science which it never was and never can be" (Bacon, 1988; 2)

This tendency to see transportation somewhat in isolation from the broader problems and issues in the city and a general lack of vision, leads to a growing isolation between transport planners and decision makers. From the technical viewpoint it is safer for many to stay more or less within the framework and methods developed within the period of the "grand plans", which basically view increasing motorisation as almost inevitable and the 'rightness' of more roads as a God-given truth, than to provide policy direction and vision–a contribution which might help cities find a way of breaking the automobile planning treadmill.

Technical failures

Even when judged on the basis of whether the technical procedures are producing accurate predictions of, for example, future traffic flows and relationships between public and private transport, the overwhelming weight of evidence has been on the negative side (Atkins, 1986). It is one thing for a transport-land use model to accurately reproduce the present situation. It is quite another for it to accurately reflect what may happen in the future under a complex array of urban pressures and forces, or what the result might be where a city is given a glimpse of a future quite different to what exists today. There is a danger that the modelling process is so shaped by existing patterns that it is unable to respond correctly or creatively to significantly different circumstances (e.g. markedly higher localised TOD densities) or to meaningfully incorporate significant factors outside its usual outlook (complex climate change, social changes or qualitative changes in the city environment that demand new approaches). Conventional transport modelling is simply too geared to extrapolating and magnifying existing patterns to be of significant use in guiding cities towards an alternative future. The future being demanded today in all cities is for a low carbon, regenerative approach to the urban environment, which at the same time delivers a high quality of life.

In particular, the techniques of transport planning are not well-suited to predicting human responses to qualitative changes in the character of a city or the way people may respond to a new transport option. The models may suggest little if any response and yet the changes may be quite rapid and marked. For example, a city may make a major effort to humanise its central city through urban design improvements, city art and festive market places, pedestrianisation schemes, and other traffic limitation strategies. At the same time it may decide to install or upgrade rail services with the result that people may discover new ways of experiencing their city. This can begin to set new relationships between transport and land use including reductions in parking, greater demand for central and inner city housing, joint development of high density, mixed use TOD complexes around stations, better pedestrian and bicycle links and facilities and still more public transport. Travel behaviour and housing options can change quite rapidly under these circumstances, in ways that transport modelling does not anticipate or incorporate well. Certainly, it would be most unlikely that a conventional transport planning study would recommend that such changes be made to a city.

To a great extent all the changes just mentioned have happened in Portland, Oregon over the last 25 to 30 years, at least in the central and inner city areas. Twenty to thirty years is a rather typical time horizon for a transport planning study. Portland's transportation plans of the 1970s were for more freeways, which would have added more traffic pressure to downtown Portland and made it a less hospitable place. Transport patterns would have been a continuation of existing trends rather than a significant break in them. Instead Portlanders built a new light rail line (MAX, opened in 1986) in place of a freeway and embraced it and their revitalised central city in a way that was not predicted by any transport studies. The story of how this change occurred so that conventional transport plans were rejected and a new vision enacted is a valuable case study (Edner and Arrington, 1985).

Other cities too have shown surprisingly rapid land use adaptation and success with their new rail systems. For example, Washington DC and in particular some Canadian cities such as Vancouver have numerous examples of integration between new rail systems and high density, mixed use development (Newman and Kenworthy, 1999; Schiller et al, 2010). Los Angeles' rail development was linked in its planning phases to proposed major new commercial and mixed-use developments (Keefer, 1986) and this has occurred both around its new Metro stations on the Red and Purple lines (e.g. at Wilshire/Vermont and Hollywood and Vine) and around the light rail system (e.g. at Del Mar station on the Gold line).

The retreat into ever-increasing sophistication and microscopic detail in the techniques of transport planning without a clear vision, aim or goal, seems to lead to an increasingly deadened sense of purpose within the profession and an inability to provide policy makers with sound guidance. Decision-makers, who must cope with an increasingly complex set of demands related to local, regional, national and global sustainability needs, provision of more diverse housing options, social and community needs and depressed financial situations, often find many of the prescriptions from traditional transport analyses blinkered and unworkable.

In summary, the technical world of transport planning finds it difficult to get beyond a view that the city's future can be predicted and provided for by mathematical equations based on often-debatable transport economic and behavioural theories. Relative transport costs, resource efficiency measures, narrow cost-benefit analyses and other abstractions from the world of transport modelling are not of themselves adequate to the task of guiding decision making and fulfilling diverse community expectations about the future of a city and its quality of life. Without a wider social and environmental as well as broader economic context, transport planning often loses sight of other important forces and is always at risk of working in a vacuum, producing answers that are of little or no use to politicians, the community and business leaders, or the long term sustainability and liveability of cities.

6. Planning with vision

It is very rare to find a transport planning treatise which makes a clear statement about the broader intent of the work, a statement which sets a clear human context or vision and gives the mathematical and modelling work substance, direction and meaning. Transport and Reurbanisation (Klaassen et al, 1981), historically was one of the first works to break this mould. While clearly translating its transport prescriptions for cities into mathematical modelling terms, transport was clearly directed towards encouraging a process of "reurbanisation" which the authors saw as crucial to the total life and meaning of the city. They make a very clear statement early in the work that sets a human context for their transport planning expertise and makes the book readable and meaningful.

They describe 'reurbanisation', their ultimate goal, in the following way:

> "The process thus set going is one of once more turning degenerated urban patches into city quarters with living cores, fulfilling a real economic, social and cultural function, a process of reurbanisation. Its ultimate fascinating objective is the revival of the old core cities, fascinating to many individuals who have learnt in hard practice that living near to nature means mowing the lawn every week, driving downtown in long queues every morning and driving out of town in long queues in the evening; that a suburban home means buying a second car for their wives so that they may flee the periphery, etc. The more people realise all this, the less they will want to leave the inner city if they are still there, and the stronger will become the desire to live just there, leading a modern life in an old town full of atmosphere"(p. 36).

With the benefit of hindsight, reurbanisation is in fact what many cities have been embracing since that time. In the case of Australian cities, this started as "urban consolidation", the US cities have their "smart growth" programmes and countless European cities have been and still are regenerating former industrial and port areas into vibrant new communities (e.g. Hafen City, Hamburg to name just one).

Experience in Perth, Western Australia

Perth's urban history strengthens the view that the seemingly objective and technically "correct" or safe view from the world of transport planning fails to respond to the realities and needs of the changing city. For years Perth had numerous transport studies, performed using methods and techniques respectable in the best of transport planning circles. They all predicted growing car orientation, declining public transport and a need for bigger and better roads. And this is what was experienced, certainly until the late 1970's and early 1980's.

During the late 1970's and into the 80's, there was a sense in some quarters that the city was being cast along a path of self-fulfilling prophecies. The old diesel suburban rail lines were being systematically removed or run down (the 19 km Fremantle line, one of only three suburban rail lines, was closed to secure land for a freeway) and new land for more freeways was being reserved on increasingly tenuous grounds for roads with no known date of construction exposing government to enormous claims for injurious affection and resulting in the Road Reserves Review (Government of Western Australia, 1991). Led by a civil society action group called "Friends of The Railways" established in early 1979 to oppose the Fremantle rail line closure, a change in political direction provided a window of opportunity to redress Perth's lopsided transport planning and this began a fundamental and far-reaching momentum in favour of public transport and more compact urban development patterns, which could help reshape the car dependent urban environment. A petition with 110,000 signatures against the Fremantle line closure was presented to the State Parliament in 1979, at a time when the population of Perth was about 860,000. Real pressures for such changes had been creeping up continually through the 1970's, however it wasn't until the mid-80's that a real consensus started to develop at the political level that something needed to be done to balance Perth's urban sprawl and road orientation.

Little help was provided from the urban transport planning fraternity who continued to provide road-oriented solutions and unimaginative public transport studies, which invariably favoured busways over railways. At the political level, amongst some legacy-driven politicians, a vision began to develop of the way the city needed to change and how this might occur. This constituted a realisation that the only way the city was going to generate innovative initiatives was to seriously question the car and bus-based solutions. This required embracing ideas from community, academic and professional sources whose experience and perspective outside traditional transport planning suggested that other directions were possible (Newman, 2011).

After the reintroduction of the old Fremantle diesel rail service in 1983 and during the subsequent electrification of the whole rail system from 1988 to 1991, achievements that involved the community and politicians being forced to lead their transport professionals into a more balanced and visionary approach, the next focus was on the sprawling northern suburbs. The northern corridor has taken a huge share of Perth's urban growth over many decades, based firmly on the automobile and low-density suburbs. A freeway was provided in the centre of the corridor, but after great popularity in the beginning, it rapidly became congested causing many people in the late 1980s to demand better transport options for the corridor, the most popular of which was a rail line (Newman, 1992).

A rapid transit study was conducted in the 1980s which concluded that an O-Bahn busway or a train service could be introduced in the middle of the freeway - an option made possible at the insistence of a former Labor Premier of WA in the early 1970s, not by transport planners who, on the contrary, had in previous decades removed two rail reserves from the metropolitan planning scheme. The transport consultants involved the community in the assessment of the options and a clear preference for rail was given. The consultants however concluded, with encouragement from Perth's transport planners, that a busway was preferred on cost grounds. A further study was done which evaluated this report and brought in more of the land use options created by rail, which a busway does not provide (as well as highlighting a technical issue about where all the buses entering the central city from the busway would actually end up). This new report preferred rail and showed it to be a viable economic option, so a government decision was made to build the first major extension of a suburban rail system in modern Australian history (Newman, 1992).

A $400m commitment to electrifying the three old rail lines and building a new line to the northern suburbs, was the biggest single capital investment by the State Australian Labor Party government in its term of office during that time. The popularity of the decision and the shifts in thinking about land use since then (containing urban sprawl, focusing on development near rail stations etc), have confirmed the game-changing nature of this decision.

In order to maximise the potential of the connection between land use and rail services in the way Toronto, Vancouver, Singapore and other cities have done, it became necessary for Perth to gain experience in areas such as joint public-private development and value capture around railway stations. These approaches have been common practice in many cities for some years, particularly those that have installed new rail systems (e.g. Los Angeles' Special Benefit Assessment Districts around rail stations). This shift to a rail orientation set a new context for public transport planning in Perth and offered the opportunity to better link land use planning to the public transport system in projects, such as Perth's "Subi Centro" TOD at Subiaco railway station a few kilometres west of the CBD. This is something that would not have happened while road and bus planning predominated.

It has now become accepted that it is not sufficient for the Government to just build and operate a new rail system. Rather, much of the community, the development industry as well as the public transport operator, acknowledge that they can all benefit together by ensuring that the potential of the rail system to help reshape the city is fully realised. These new forces are now changing the nature of the city, incrementally and in small, slow steps, away from more car dependence and dispersed land use, into a more focused and transit-oriented city.

Figure 1 shows the growth in total rail usage in Perth and Adelaide over the last 23 years. In Perth, where improvements and extension of the system has occurred, usage has exploded six-fold from 1988 to 2011. In Adelaide, which had a similar and comparable suburban diesel rail service to Perth in the 1980s (and still has, apart from an extension of its one tram line), but has experienced no politically or community-led rail revival until now, rail use has stagnated.

Experience in Portland, Oregon

Similar experiences occurred in Portland, Oregon through the 1970's and 1980's. The long fight in Portland away from the early technical transport studies and their overwhelming road orientation is summarised by Edner and Arrington (1985) in the following way:

> "…initial political stirrings for a transit option were substantially unsupported by comprehensive technical studies. The thrust was to wean Portland away from a highway-based system and buy time to develop a balanced alternative using transit and limited highway improvements." (p. 14)

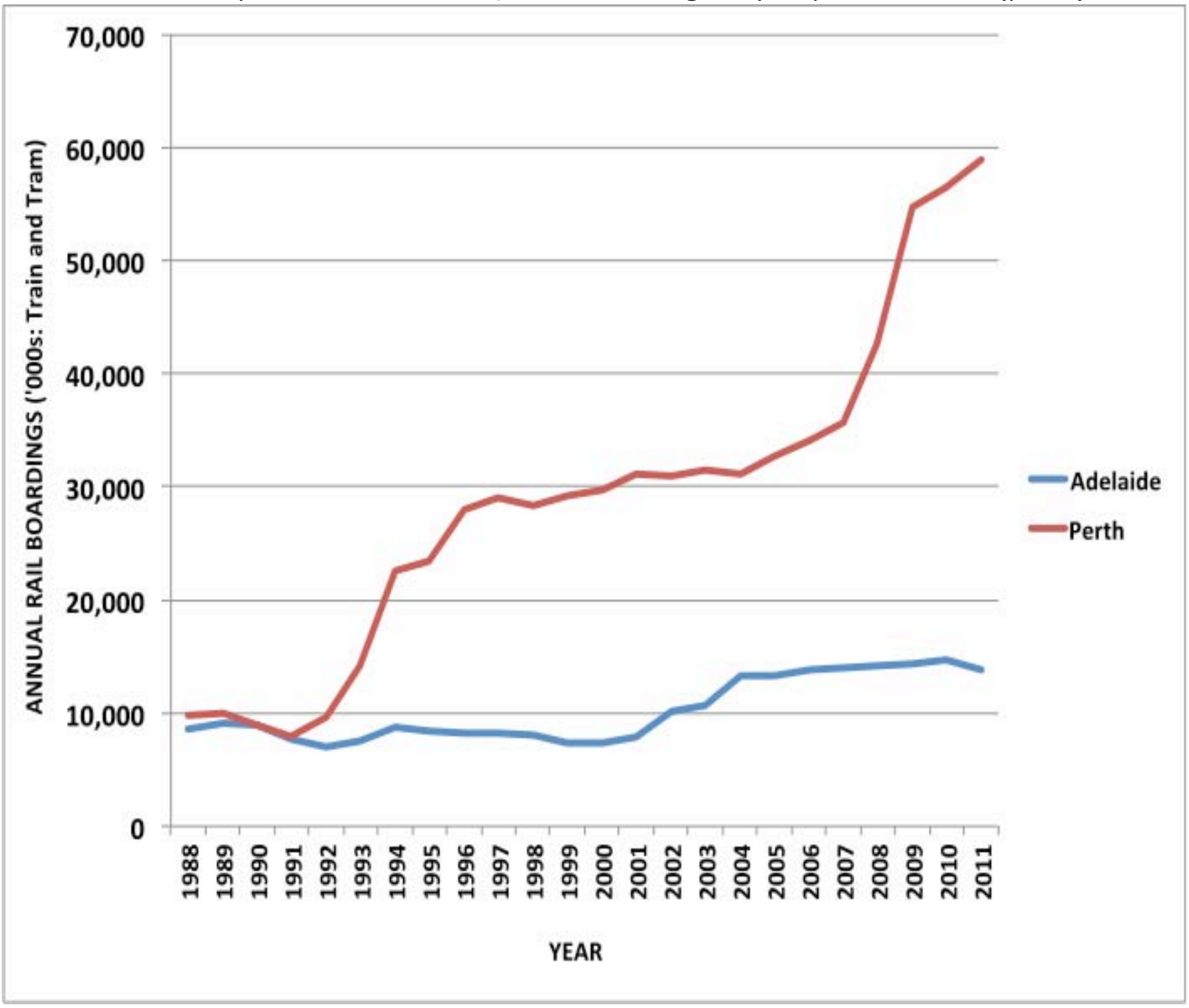

Figure 1. Perth and Adelaide rail use from 1988 to 2011.
Source: Constructed from public transport operator data from Perth and Adelaide

This involved doing some new technical studies with an emphasis on transit, but this time under the auspices of Oregon's Governor who was convinced that change was needed.

> "The key question facing the Governor's Task Force (GTF) was whether transit was a viable alternative to freeway investment. Sixty-eight system configurations for the region were ultimately evaluated. These configurations were identified as alternatives to PVMATS (Portland-Vancouver Metropolitan Area Transportation Study) and its highway emphasis. That study, initiated in 1959 but not formally adopted until 1971, assumed that transit ridership and operation would stabilize and, at worst, continue a trend of decline into the future." (p. 14)

Like nearly every 'grand plan' from the 1950's, Portland's transportation study was roads-orientated and virtually assumed the demise of public transport. However, the GTF's report provided the first technical justification for transit based on a range of factors including positive environmental effects, but more importantly according to Edner and Arrington:

> "…it set the stage for developing the technical and political decision-making capability for regional transit planning. The GTF report was a crucial element in the decision to withdraw the Mt Hood Freeway…This technical justification initiated a linked technical/political decision-making process… Freeways were de-emphasized to the benefit of transit and a CBD focus." (p. 15)

They summarise the decision to build a rail line instead of a freeway as:

> "…a major shift in the functional and philosophic role of transit in the region… (which) …ruptured the political fabric of transportation decision-making, realigning the roles and responsibilities of many political and technical actors." (p. 2)

In both Perth and Portland transport planning was really forced through a political process, especially involving the community, to take on new directions. There was little evidence that the transport profession was about to provide the initiatives itself.

7. Transport planning–the crucial link to land use

Ultimately the transport problem is a land use problem. Porter (1987) in discussing America's rapid slide into national gridlock in the 1980s stated that:

> "Most communities are trying to overcome the traffic crisis in ways that actually perpetuate it. Most projects being planned and developed in fast growing areas build in automobile dependency, which leads to congested arteries which results in cries to reduce densities of development, which in turn creates greater dependency on automobiles." (p. 34)

Pucher (1988) described and compared the success of urban public transport subsidies in the US in relation to other countries and found that in virtually no other country have subsidies been as ineffective as they have been in the US. His final conclusion makes the point that without:

> "…policies to increase the cost of auto travel and to promote a more compact land-use pattern, it seems unlikely that any significant changes will be possible in the US urban transportation system." (p. 402)

It would still appear today that if transport planning is to provide any clear policy guidance to decision-makers confronted with how to respond to car dependency and congestion, the planners' approach must incorporate some more radical visions of compact land use patterns both in developing areas and through selective infill and redevelopment in older areas. The way technical transport studies are conceived and the policies and prescriptions that result from them, can then be geared towards achieving those visions. Even if some of the solutions seem unachievable within prevailing social, economic and political realities, the fact that an attempt has been made to provide an alternative vision is a forward step, which develops momentum. In particular, it can begin to give substance to the idea that a better balance between cars and other modes is possible. Once started, this momentum can gradually filter its way through communities, bureaucracies and the political arena and finally into concrete change, as has been the case in Portland and Perth.

It is interesting that in Portland the process of planning and building MAX was characterised by a lot of cynicism particularly in the press. A competition was run to find the best name for the system. A Street Car Named Expire finally won. MAX however is a big success, both as a transport system and as a focal point for new development. Howard (1988) reported shortly after the opening of the first line in 1986, that benefit assessment districts established in downtown to return to the community some of the private land value increases of the system " have proven very successful, partly because the system is so appealing to the public that the development community is jumping on the bandwagon to expand the scope of that program" (p172). Having made the big break and built a railway instead of a freeway, the next steps were easier. The only arguments in Portland about MAX became who should get the next extension.

Circumstances also change, which make what is achievable a constantly changing thing. For example, in Perth 27 years ago it would not have been conceivable that the city would now have electrified three existing rail lines, constructed a 33 km line to the north, a 71 km line to the south and be actively pursuing the development of a LRT system and further heavy rail extensions and new lines. Nor would it have been thinkable that all these changes would also be allied to efforts at rail stations to provide a focus for land use development. These changes did not come out of traditional transport planning analyses, but there is a chance that they could have, given the right issues, contexts and goals to shape the transport planning process.

8. Making transport planning a better tool in reshaping the auto-city

There is nothing inherent in the actual techniques of the land use-transport modelling process or the other technical procedures of transport planning which will inevitably produce road-biased results. It is more the way decisions are made about how to use the techniques. Historically road planners have dominated this exercise. If a genuine attempt is made to consider alternatives to urban sprawl and more freeways, which is accompanied by a community engagement process, such as Perth's Dialogue With The City (see Schiller et al, 2010), it is possible to give new directions to the transport planning process. It is also possible to build in more sophisticated feedback mechanisms where transport and land use are dealt with in an iterative manner, one progressively affecting the other. This would in all likelihood be an improvement over existing practices, though the results of such models are still subject to considerable debate and inconsistency and are by no means guaranteed to come up with prescriptions, which will assist cities in transitioning to lower car dependence (Webster, Bly and Paulley, 1988).

Ultimately it comes back to the first stage of the process - the formation of goals and objectives. In the past, and unfortunately still today in many places, land use-transport modelling has chased something of a fairy-tale world where transport demand and supply are meant to be kept in equilibrium by planning road systems to cope with projected traffic volumes–a sort of "transport utopia". The pressing requirement was, and often still is, to try to keep ahead of congestion. Interestingly, even after decades of experience in US and UK cities of building freeways while congestion relief remained an elusive goal, large new roads are still today called for and justified for their ability to relieve congestion. Fundamentally, in too many places a genuine alternative, such as minimising unnecessary private motorised travel, has not really been embraced. Too often, walking and bicycling are not considered in any serious way, while public transport is often still seen as an addendum to the main game of catering for private mobility.

In many cases there is very little meaningful variation in the different scenarios provided by transport studies – just minor variations on a fundamentally road-oriented theme.

A change to more comprehensive planning requires better specification of the goals and objectives of transport studies and more emphasis on public transport in the models. Since the 1980s there has been a rapid growth in new light rail systems throughout the USA and Canada (commencing in Edmonton in 1978 and then Calgary and San Diego in 1981). These new systems have been introduced largely as broader community or politically led initiatives in response to a dire need for mobility alternatives, rather than as technical decisions from conventional transport analyses. This political and community-driven response reflects widespread disenchantment with the problems created by automobile dependence such as congestion, local, regional and global environmental impacts and social and economic inequity in transport. Rather than promoting greater freedom, unbridled personal mobility derived from mass prosperity and automobile use, have created high levels of individual frustration where a car is the only alternative for most trips (Eno Foundation, 1988).

Urban and transport planners everywhere can assert their role in the development of cities through new goals and objectives for transport-land use modelling based around balancing the roles of various modes of transport, minimising total motorised travel in the urban system and reducing the costs of urban land development through reducing urban sprawl – in short creating more sustainable and indeed regenerative cities. There is no compulsive reason why transport planning should favour roads and suburban sprawl to the exclusion of other modes and more compact patterns of development. As stated by the last major Australian urban "grand plan", the Sydney Area Transportation Study (SATS, 1974) concerning land use-transport modelling:

> "Some of the inputs into the models are based on assumptions of a political nature or those containing value judgements… transportation models cannot directly give answers to policy questions, nor can they derive transportation system alternatives. Final decisions cannot be reduced to a set of mathematical equations." (p II-1).

9. Conclusion

The key to making transport planning a better contributor to policy development does not lie in giving what amounts to open-ended briefs, such as asking computer-modelling studies to predict traffic 20 years into the future and how many new roads are going to be necessary to cope with it. History shows that under this kind of direction it is almost assured that within the logic of the models' own analysis enough traffic will be foreseen to justify any number of new roads. This is how the grand transportation studies of the 1950's, 60's and 70's universally recommended elaborate freeway networks and presided over a massive decline in urban public transport.

Even asking traffic models to assess whether traffic projections alone justify the construction now of a particular road, tends to take the decision out of context with other important values, visions and directions in the city, which are often in direct opposition to the idea of building more road capacity (e.g. the aforementioned conflict in Bremen between building a new ring road and all its sustainable transport achievements to date). The internal workings of traffic models tend to generate self-fulfilling prophecies of traffic and future road needs without consideration of the broader implications. Such an approach is an invitation to perpetuate or strengthen dependence on the car and a sure way of generating a sense of powerlessness within public planning about influencing the future land use and transport directions of any city.

What appears to be needed is a strong vision of what overall directions are most desirable for the city and then, if necessary, to seek guidance from transport modelling about how to get there. Questions about the need for new roads should not be put in terms of "Is the new road justified on traffic grounds?" Based on historical experience, traffic models are very likely to conclude that it is. Rather we should be asking questions such as:

• Is the new road in keeping with the vision of the future city and its sustainability and will building it contribute to or detract from this?

• Is it desirable to see the projected traffic growth fulfilled or should planning policy actively seek to prevent or modify, rather than facilitate that growth?

• What are the alternative options for a city in assessing a road proposal and how do these alternatives relate to a range of other objectives (e.g. environmental protection, urban regeneration, reduced resource and energy consumption, livability of neighbourhoods, accessibility for all groups in the community, transport safety etc)?

Collectively we need to be able to say what we would like the city to look like in 20 years time:

• What sort of improvements in the urban environment do we want?

• What qualities and diversity do we want in urban lifestyles? (e.g. communal spaces where once only streets existed; mixed land uses as opposed to rigid zoning; more mixture in dwelling styles and density, greater sociability versus increased privatism).

• What do we want the central city and sub-centres to look like?

• Do we want strong centres and what should the balance be in modes of access to and within these centres?

• What kind of overall population and job densities should the city aim for to minimise car dependence and where should higher densities be concentrated?

• What goals could be set in terms of reducing car dependence? (e.g. parking levels in the CBD and other centres, modal split for various types of trips including goals for walking and cycling and targets for reducing overall per capita car use).

• What goals could be set for extending or introducing new rail systems to help reduce car dependence?

Working within this type of visionary framework, transport planning can make a constructive contribution to urban policy development. The last thing that is needed is self-fulfilling road prophecies from computer models telling communities what the city will look like and what they are going to have to do to cope with such scenarios. In simple terms, "predict and provide" planning, which treats traffic as a kind of immutable liquid that will simply flow over everything if not catered for, needs to be replaced with a "debate and decide" approach which treats traffic as an expandable or compressible gas and allows cities to shape a regenerative future for themselves based on a decline in automobile dependence.

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